



Video Solution on Website:-

<https://physicsaholics.com/home/courseDetails/46>

Video Solution on YouTube:-

[https://youtu.be/veQ1\\_ryXN94](https://youtu.be/veQ1_ryXN94)

Written Solution on Website:-

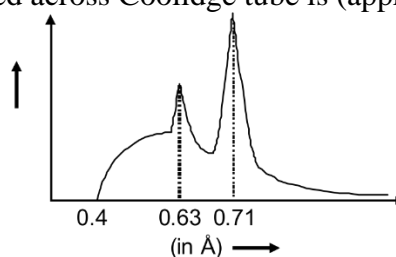
<https://physicsaholics.com/note/notesDetails/19>

- Q 1. The wavelength of X - rays decreases, when
- (a) Temperature of target is increased
  - (b) Intensity of electron beam is increased
  - (c) K.E. of electrons striking the target is increased
  - (d) K.E. of electrons striking the target is decreased
- Q 2. The minimum wavelength of X-rays produced in an X-ray tube is  $\lambda$  when the operating voltage is V. What is the minimum wavelength of the X-rays when the operating voltage is V/2?
- (a)  $\frac{\lambda}{2}$
  - (b)  $\lambda$
  - (c)  $2\lambda$
  - (d)  $4\lambda$
- Q 3. X-rays are being produced in a tube operating at  $10^5$  V. The velocity of X-rays produced in vacuum tube is
- (a)  $3 \times 10^8$  m/s
  - (b)  $2.8 \times 10^8$  m/s
  - (c)  $3.1 \times 10^8$  m/s
  - (d)  $3 \times 10^{10}$  m/s
- Q 4. The X-rays produced in a Coolidge tube of potential difference 40 V have minimum wavelength of
- (a)  $3.09 \times 10^{-8}$  m
  - (b)  $5.09 \times 10^8$  m
  - (c)  $4.09 \times 10^{-8}$  m
  - (d)  $1.09 \times 10^8$  m
- Q 5. A metal block is exposed to beams of X-ray of different wavelength. X-rays of which wavelength penetrate most
- (a) 2 Å
  - (b) 4 Å
  - (c) 6 Å
  - (d) 8 Å
- Q.6 When a beam of accelerated electrons hits a target, a continuous X - ray spectrum is emitted from the target. Which of the following wavelength is absent in X - ray spectrum, if the X - ray tube is operating at 40,000volts?
- (a) 0.25 Å
  - (b) 0.5 Å
  - (c) 1.5 Å
  - (d) 1.0 Å
- Q 7. Which of the following wavelength falls in X - ray region?
- (a) 10000 Å
  - (b) 1000 Å
  - (c) 1 Å
  - (d)  $10^{-2}$  Å



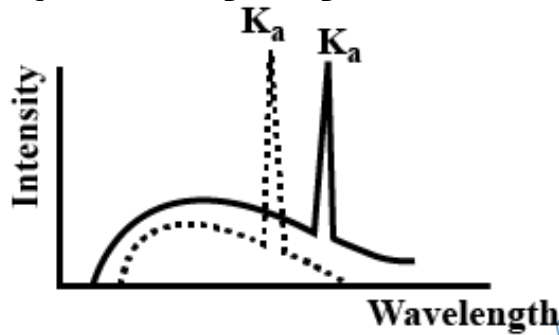
- Q 8. In X-ray tube, when the accelerating voltage  $V$  is doubled, the difference between the wavelength of  $K_\alpha$  line and minimum wavelength of continuous X-ray spectrum
- (a) Remains constant (b) becomes half  
(c) Becomes more than two times (d) Becomes less than two times
- Q 9. Mosley measured the frequency ( $f$ ) of the characteristic X-ray from many metals of different atomic number ( $Z$ ) and represented his results by a relation known as Moseley's law. This law is (a, b are constant)
- (a)  $f = a(Z - b)^2$  (b)  $Z = a(f - b)^2$   
(c)  $f^2 = a(Z - b)$  (d)  $f = a(Z - b)^{1/2}$
- Q 10. If the frequency of  $K_\alpha$  X-rays emitted from the element with atomic number 31 is  $v$ , then the frequency of  $K_\alpha$  X-rays emitted from the element with atomic number 51 would be
- (a)  $\frac{3}{5}v$  (b)  $\frac{51}{31}v$   
(c)  $\frac{25}{9}v$  (d)  $\frac{9}{25}v$
- Q 11. The X-ray wavelength of  $L_\alpha$  line of Platinum ( $Z=78$ ) is  $1.30 \text{ \AA}$ . The X-ray wavelength of  $L_\alpha$  line of Molybdenum ( $Z = 42$ ) is (constant  $b = 7.4$ )
- (a)  $5.41 \text{ \AA}$  (b)  $4.20 \text{ \AA}$   
(c)  $2.70 \text{ \AA}$  (d)  $1.35 \text{ \AA}$
- Q 12. An X-ray tube operates at  $40 \text{ kV}$ . Suppose the electron converts 70% of its energy into a photon at each collision. Find the 2<sup>nd</sup> lowest wavelengths emitted from the tube. Neglect the energy imparted to the atom with which the electron collides
- (a)  $44.28 \text{ pm}$  (b)  $147.61 \text{ pm}$   
(c)  $493 \text{ pm}$  (d)  $122.43 \text{ pm}$
- Q 13. The wavelength of  $K_\alpha$  X-rays produced by an X-ray tube is  $0.76 \text{ \AA}$ . The atomic number of the anode material of the tube is (Considering that Bohr's model is applicable)
- (a) 57 (b) 39  
(c) 34 (d) 41
- Q 14. Figure shows intensity versus wavelength graph of X-rays coming from Coolidge-tube with molybdenum as target element. The two peaks shown in graph correspond to  $K_\alpha$  and  $K_\beta$  X-rays.

Wavelength of  $L_\alpha$  X-rays from Coolidge tube will be (approximately) and Voltage applied across Coolidge tube is (approximately)



- (a) 1.2 Å, 20 kV                      (b) 2100 Å, 16 kV  
 (c) 5.6 Å, 31 kV                      (d) 12.3 Å, 18 kV

Q 15. Given curve shows the intensity wavelength relation of X-rays coming from two different Coolidge tubes A and B. The dark curve represents the relation for the tube A in which potential difference between the target and the filament is  $V_A$  and the atomic number of the target material is  $Z_A$ . Similarly dotted curve is for tube B. Respective quantities are  $V_B$  and  $Z_B$  for the tube B. Then



- (a)  $V_A > V_B, Z_A > Z_B$   
 (b)  $V_A > V_B, Z_A < Z_B$   
 (c)  $V_A < V_B, Z_A > Z_B$   
 (d)  $V_A < V_B, Z_A < Z_B$

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## Answer Key

Q.1 c	Q.2 c	Q.3 a	Q.4 a	Q.5 a
Q.6 a	Q.7 c	Q.8 d	Q.9 a	Q.10 c
Q.11 a	Q.12 b	Q.13 d	Q.14 c	Q.15 b